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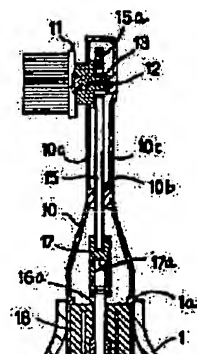
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Application no/date: 1993- 35300 [1993/ 2/24]
 Date of request for examination: [1998/ 6/ 5]
 Accelerated examination ()
 Public disclosure no/date: 1994-245820 *Translate [1994/ 9/ 6]
 Examined publication no/date (old law): []
 Registration no/date: 3005608 *Translate [1999/11/26]
 Examined publication date (present law): [2000/ 1/31]
 PCT application no:
 PCT publication no/date: []
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 IPC: A46B 13/02 A61C 17/00 A61C 17/22
 FI: A46B 13/02 A46B 13/02 ,700 A61C 17/00 L
 F-Term: 3B202AA07, BC04, BC05, BD04, BD07, BE10, 4C045UU08
 Expanded classification: 303
 Fixed keyword:
 Citation: [19,1999. 5.17,] (, ,)
 Title of invention: MOTOR OPERATED TOOTH BRUSH

Abstract: PURPOSE: To provide a simple-structure and inexpensive motor operated tooth brush that has a higher tooth brushing ability by giving reciprocating motion to an attachment which has a brush and rotational motion to a brush which is connected to the attachment. CONSTITUTION: First and second drive shafts 8 and 9 are supported within a case 1 so that they can move freely in the longitudinal direction, and the rotation of a drive motor 2 within the case 1 is converted into two reciprocating motions that moves in different directions each other by first motion conversion mechanisms 41, 42, 71, and 72 and is transmitted to second drive shafts 8 and 9. The first drive shaft 8 is connected to an attachment 10 which has a rotatable brush 11 at its head so that the brush can rotate freely. The longitudinal reciprocating motion of the first and second drive shafts 8 and 9 are converted into a rotational motion by second motion conversion mechanisms 13 and 15a and is transmitted to the rotatable brush 11. COPYRIGHT: (C)1994, JPO&Japio



TRANSLATION FROM JAPANESE

(19) JAPANESE PATENT OFFICE (JP)

(12) Patent Gazette (B2)

(11) Patent No. **3005608 (P3005608)**

(24) Registration Date: 1999.11.26

(45) Publication Date: 2000.1.31

| Identification | | JPO | |
|----------------------------|--------|------------|-----|
| (51) Int. Cl. ⁶ | Symbol | File No. | FI |
| A46B 13/02 | | A46B 13/02 | |
| A61C 17/00 | | | 700 |
| 17/22 | | A61C 17/00 | L |

Number of Claims: 3

(4 pages total [in original])

(21) Patent Application No.: 5-35300

(22) Filing Date: 1993.2.24

(65) Unexamined Patent Application (Kokai) No.: 6-245820

(43) Disclosure Date: 1994.9.6

Examination Request Date: 1998.6.5

(73) Assignee: SEIKO PRECISION CO. LTD.

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(58) Searched Fields (Int. Cl.⁷, DB Title)

A46B 13/02

A61C 17/00

A61C 17/22

(54) [Title of the Invention] **Electrically powered toothbrush**

(57) [Claims]

[Claim 1] An electrically powered toothbrush comprising:

 a drive motor housed within a case;

 a first drive shaft supported within said case and displaceable in the axial direction;

 a second drive shaft displaceable in the axial direction within said case and supported along said first drive shaft;

 a first motion conversion mechanism for receiving the drive force of said drive motor and converting rotation of said drive motor into reciprocating motion in two mutually different directions, [said two different reciprocating motions] being respectively transmitted to said first drive shaft and said second drive shaft to cause said first drive shaft and said second drive shaft to undergo reciprocating motion in two mutually different directions in the direction of the axis;

 an attachment coupled with said first drive shaft so as to undergo reciprocating motion in the same direction as said first drive shaft in association with reciprocating motion of said first drive shaft in the axial direction;

 a brush head rotatably attached to the distal end of said attachment; and

 a second motion conversion mechanism for converting reciprocating motion of said attachment and reciprocating motion of said second drive shaft in two different directions in the direction of the axis into motion in the same direction, and transmitting this [motion] to the brush head.

[Claim 2] The electrically powered toothbrush according to claim 1 further comprising an extension bar, housed within said attachment, linked to said second drive shaft and capable of relative motion with respect to said attachment;

 said extension bar comprising a rack for meshing with a pinion provided to the rotating shaft of said brush head; and

 said second motion conversion mechanism comprising said pinion and said rack.

[Claim 3] The electrically powered toothbrush according to claim 1 or 2 wherein said second drive shaft concentrically passes through said first drive shaft.

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JP 3005608

CLAIMS

(57) [Claim(s)]

[Claim 1] The drive motor formed in the interior of a case, and the 1st driving shaft currently supported free [migration to shaft orientations] inside the above-mentioned case, That migration to shaft orientations is free inside the above-mentioned case, and the 2nd driving shaft currently supported in accordance with the 1st driving shaft of the above, So that it may reciprocate to the shaft orientations from which the 1st driving shaft of the above and the 2nd driving shaft of the above differ mutually in response to the driving force of the above-mentioned drive motor The 1st movement translator which changes rotation of the above-mentioned drive motor into the reciprocating motion of a 2-way with which the movement directions differ mutually, and is transmitted to the 1st driving shaft of the above, and the 2nd driving shaft of the above, respectively, The attachment connected with the 1st driving shaft of the above so that it may reciprocate in the 1st driving shaft of the above, and this direction with the reciprocating motion to the shaft orientations of the 1st driving shaft of the above, The brush object prepared in the point of the above-mentioned attachment free [rotation], The electric toothbrush characterized by having the 2nd movement translator which changes into both-way rotation of this direction the reciprocating motion of a 2-way with which the reciprocating motion of the above-mentioned attachment differs from the reciprocating motion of the shaft orientations of the 2nd driving shaft of the above, and is transmitted to the above-mentioned brush object.

[Claim 2] The electric toothbrush according to claim 1 characterized by to have prepared relatively the extension bar connected with the 2nd driving shaft of the above movable to the above-mentioned attachment in the interior of the above-mentioned attachment, to have prepared the rack which gears with the pinion prepared in the revolving shaft of the above-mentioned brush object to the above-mentioned extension bar, and to constitute the movement translator of the above 2nd with the above-mentioned pinion and the above-mentioned rack.

[Claim 3] The 2nd driving shaft of the above is an electric toothbrush according to claim 1 or 2 characterized by having penetrated the 1st driving shaft of the above in same axle.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to an electric toothbrush.

[0002]

[Description of the Prior Art] About the electric toothbrush, many things are proposed conventionally and a variety of electric toothbrushes are marketed till today. the thing it was made to drive to the longitudinal direction by the motor which has prepared the typical thing free [migration] and free [attachment and detachment] also in it relatively [the attachment which has a brush object in the upper limit section / case], and has been formed in the interior of a case -- or there is a thing it was made to drive the brush object itself instead of an attachment. For example, the electric toothbrush with which it was made for the hair ends of a brush to vibrate finely is indicated by JP,61-55963,B. Moreover, the electric toothbrush which makes the gear-tooth brush attached in the driving shaft reciprocate along the shaft orientations or the direction of an axial right angle is indicated by JP,61-64204,A. The electric toothbrush which made adjustable the stroke of reciprocation of the shaft orientations given to a gear-tooth brush is indicated by JP,61-79410,A further again.

[0003]

[Problem(s) to be Solved by the Invention] In what gave a fine vibration to the gear-tooth brush among the above-mentioned Prior arts, when the body of a gear-tooth brush is grasped strongly, this fine vibration is absorbed, and the vibration displacement of a brush object becomes close to zero, and is inferior to the toothbrushing effectiveness. Moreover, in what gave movement to the attachment section (part equivalent to the shank of the usual gear-tooth brush) which has a brush object, the brush object itself has fixed to the attachment and it is immobilization. Moreover, in the thing it was made for the brush object itself to rotate, the part of the attachment which has a brush object serves as immobilization. So, in this invention, it aims at offering cheaply the electric toothbrush which was excellent in the toothbrushing effectiveness with an easy configuration by giving rotation to the brush object itself prepared in this attachment at the same time it gives the reciprocating motion of shaft orientations to the attachment which has a brush object.

[0004]

[Means for Solving the Problem] The drive motor formed in the interior of a case in the electric toothbrush concerning this invention, The 1st driving shaft currently supported free [migration to shaft orientations] inside the case, and that migration to shaft orientations is free inside a case and the 2nd driving shaft currently supported in accordance with the 1st driving shaft, The 1st movement translator which changes rotation of a drive motor into the reciprocating motion of a 2-way with which the movement directions differ mutually, and transmits it to the 1st driving shaft and 2nd driving shaft, respectively so that it may reciprocate to the shaft orientations from which the 1st driving shaft and 2nd driving shaft differ mutually in response to the driving force of a drive motor, The attachment connected with the 1st driving shaft so that it may reciprocate in the 1st driving shaft and this direction with the reciprocating motion to the shaft orientations of the 1st driving shaft, It is characterized by having the 2nd movement translator which changes into both-way rotation of this direction the reciprocating motion of a 2-way with which the reciprocating motion of an attachment and the reciprocating motion of the shaft orientations of the 2nd driving shaft differ from the brush object prepared in the point of an attachment free [rotation], and is transmitted to a brush object. Moreover, the extension bar connected with the

2nd driving shaft is preferably prepared in the interior of an attachment movable relatively to the attachment, in this extension bar, the rack which gears with the pinion prepared in the revolving shaft of a brush object is prepared, and the 2nd movement translator is constituted with this pinion and rack. The 2nd driving shaft penetrates the 1st driving shaft in same axle still more preferably.

[0005]

[Function] It reciprocates to the shaft orientations from which it is changed into the reciprocating motion of a 2-way with which rotations of a motor differ by the 1st movement translator, and the 1st driving shaft and 2nd driving shaft differ mutually by it. At the same time the attachment which has a brush object reciprocates in the 1st driving shaft and this direction with the reciprocating motion to the shaft orientations of the 1st driving shaft. The reciprocating motion of a 2-way with which the reciprocating motion of an attachment differs from the reciprocating motion of the shaft orientations of the 2nd driving shaft is changed into both-way rotation of this direction by the 2nd movement translator, and a brush object rotates by it. [0006]

[Example] One example of this invention is explained with reference to a drawing. As shown in drawing 1 and 2, DC motor 2 which makes a driving source the dry cell which is not illustrated is provided in the case 1 bell shape interior which has opening 1a in upper limit through the supporter material 3. The bevel gear 4 is formed in the supporter material 3 free [rotation] through the shaft 5. The tooth part of this bevel gear 4 has geared with the motor pinion 6 prepared in DC motor 2.

[0007] Eccentric cams 41 and 42 are formed in the both-sides surface part of a bevel gear 4 at one. Here, two eccentric cams 41 and 42 are making the configuration where the bias from a shaft 5 shifted 180 degrees mutually, although the configuration is the same. Here, eccentricity from the shaft 5 of two eccentric cams 41 and 42 is set to $S1/2$, and $S2/2$, respectively. Cam followers 71 and 72 are engaging with eccentric cams 41 and 42, respectively. Cam followers 71 and 72 had the openings 71a and 72a which have height equal to the diameter of eccentric cams 41 and 42 as shown in drawing 1, and eccentric cams 41 and 42 have fitted in in this opening 71a and 72a. One direction rotation centering on the shaft 5 of a bevel gear 4 is changed into the reciprocating motion of the two vertical directions where the movement directions differ mutually by the cam followers 71 and 72 which follow rotation of eccentric cams 41 and 42, respectively. These eccentric cams 41 and 42 and cam followers 71 and 72 constitute the 1st movement translator which changes rotation of DC motor 2 into two reciprocating motions. In the center of the upper part of the supporter material 3, the 1st driving shaft 8 which makes the shape of hollow is supported free [sliding] in accordance with the shaft orientations (the vertical direction of drawing 1). The lower limit section of the 1st driving shaft 8 has connected with arm section 71b of the cam follower 71 upper part, and the reciprocating motion of the vertical direction of a cam follower 71 is transmitted to this 1st driving shaft 8. Inside the hollow of the 1st driving shaft 8, the 2nd driving shaft 9 has penetrated in same axle. The lower part of this 2nd driving shaft 9 It was crooked in the shape of L character, and has projected from notch 8a of the 1st driving shaft 8, that protrusion lower limit section 9a has connected with heights 72b of the cam follower 72 upper part, and the reciprocating motion of the vertical direction of a cam follower 72 is transmitted to this 2nd driving shaft 9. In addition, it is prevented that the water which invaded from upper limit opening 1a of a case 1 trespasses even upon the case 1 interior in which DC motor 2 and the bevel gear 4 grade are prepared by the supporter material 3. The point of the 1st driving shaft 8 is equipped with the attachment 10 which has opening 10a free [attachment and detachment] through the connection adapter 16 mentioned later in the lower limit. Therefore, the both-way drive of this attachment 10 is relatively carried out in the vertical direction to a case 1 at the 1st driving shaft 8 and one. The shaft 12 is formed in the interior of the tip of an attachment 10. The rotation brush object 11 as a brush object which has two or more brushes is established free [rotation] and free [attachment and detachment] to the attachment 10 through this shaft 12. On the shaft 12 which is the center of rotation of the rotation brush object 11, the pinion 13 rotated to this rotation brush object 11 and one is supported to revolve. Two or more heights 10b is formed in the interior of an attachment 10. It is supported so that the extension bar 15 can slide freely in accordance with those shaft orientations (the vertical direction of drawing 1) by this heights 10b inside an attachment 10. The upper limit section of the extension bar 15 is crooked in the shape of L character, and rack 15a which gears with the tooth part of a pinion 13 to this flecion is formed. In addition, weep hole 10c for draining the water which invaded from between an attachment 10 and the rotation brush objects 11 is formed in the peripheral face of an attachment 10. The connection adapter 16 which has through tube 16a in the center is fixed to the lower

part of an attachment 10. When an attachment 10 is inserted in upper limit opening 1a of a case 1, the lower limit section of through tube 16a of this connection adapter 16 connects with the upper limit section of the 1st driving shaft 8. Therefore, the both-way drive of the attachment 10 is relatively carried out in the vertical direction to a case 1 at the 1st driving shaft 8 and one. In addition, when the connection adapter 16 equips the 1st driving shaft 8 in this way, the upper limit section of the 2nd driving shaft 9 which penetrates the 1st driving shaft 8 carries out the penetration protrusion of the through tube 16a of the connection adapter 16, and advances inside an attachment 10. In the lower limit section of the extension bar 15, the connection coupler 17 which has opening 17a in the lower limit is fixed. Opening 17a of this connection coupler 17 connects with the upper limit section of the 2nd driving shaft 9, when the 1st driving shaft 8 is equipped with the connection adapter 16 of an attachment 10. Therefore, while an attachment 10 exercises in the vertical direction to a case 1 united with the 1st driving shaft 8, the extension bar 15 connected with the 2nd driving shaft 9 exercises in the vertical direction to a case 1 united with the 2nd driving shaft 9. At this time, as for the reciprocating motion of the vertical direction of an attachment 10, and the reciprocating motion of the vertical direction of the extension bar 15, the movement directions differ mutually. In addition, the stroke of vertical movement of the 1st driving shaft 8 is set to S1, and the stroke of vertical movement of the 2nd driving shaft 9 is set to S2 (refer to drawing 3). For this reason, as shown in drawing 3, while a pinion 13 moves up and down with vertical motion by the stroke S1 of an attachment 10, rack 15a which gears with this pinion 13 also moves up and down by stroke S2. Consequently, a pinion 13 rolls and moves and carries out both-way rotation of the rack 15a top at the circumference of a shaft 12. Rotation of this pinion 13 is directly transmitted to the rotation brush object 11, and both-way rotation is carried out on the attachment 10 to which the rotation brush object 11 moves up and down. [0008] Thus, the 2nd movement translator which changes into both-way rotation of this direction the reciprocating motion of a 2-way with which the reciprocating motion of the vertical direction of an attachment 10 and the reciprocating motion of the vertical direction (shaft orientations) of the 2nd driving shaft 9 change with a pinion 13 and rack 15a is constituted. Actuation is explained below. Case 1 peripheral face is grasped, and if the switch which does not illustrate is turned ON, DC motor 2 will rotate. Through the motor pinion 6 and a bevel gear 4, rotation of DC motor 2 is changed into two reciprocating motions of the longitudinal direction of a case 1 by the eccentric cams 41 and 42 and cam followers 71 and 72 which are the 1st movement translator, and is transmitted to the 1st driving shaft 8 and 2nd driving shaft 9. While this 1st driving shaft 8 and the attachment 10 of one reciprocate in the vertical direction to a case 1, the extension bar 15 also reciprocates in the vertical direction to a case 1. If an attachment 10 exercises in the vertical direction, the pinion 13 which gears to rack 15a of the extension bar 15 upper-limit section will carry out both-way rotation at the circumference of a shaft 12 (refer to drawing 3), and the rotation brush object 11 will carry out both-way rotation by the point of an attachment 10. Here, since the movement directions differ, when the center-of-rotation shaft 12 of a pinion 13 moves downward, rack 15a moves movement of an attachment 10, and movement of the extension bar 15 upwards (condition of (a) in drawing 3). On the contrary, when the center-of-rotation shaft 12 of a pinion 13 moves upwards, rack 15a moves downward (condition of (b) in drawing 3). Therefore, a pinion 13 can be more quickly rotated to the circumference of a shaft 12 by the small strokes S1 and S2. In addition, as long as it fills with this example the conditions that another side moves downward when the conditions from which this 2 movement direction differs mutually, i.e., one side, move upward although the stroke S1 of vertical movement of an attachment 10 and the stroke S2 of vertical movement of rack 15a are set up equally, you may set up so that it may differ in two strokes S1 and S2. Moreover, although eccentric cams 41 and 42 and cam followers 71 and 72 constitute the 1st movement translator which changes rotation of DC motor 2 into a reciprocating motion from this example, it is not limited to this and various approaches, such as a link mechanism and a slider style, can be considered. Although a pinion 13 and rack 15a constitute the 2nd movement translator which changes into both-way rotation of this direction the reciprocating motion of a 2-way with which the reciprocating motion of the vertical direction of an attachment 10 differs from the reciprocating motion of the vertical direction (shaft orientations) of the 2nd driving shaft 9 further again, it is not limited to this and various approaches, such as a link mechanism and a slider style, can be considered.

[0009]

[Effect of the Invention] Since rotation can be given to the brush object itself prepared in this attachment while giving a reciprocating motion to the attachment which has a brush object according to the electric toothbrush of

this invention, as explained above, the electric toothbrush which was excellent in the toothbrushing effectiveness can be cheaply offered with an easy configuration. Moreover, since two reciprocating motions with which the movement directions differ are changed into rotation of this direction and it was made to transmit to a brush object, a brush object can be more quickly rotated by small stroke.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the cross-section front view of the electric toothbrush concerning this invention.

[Drawing 2] It is the A-A line sectional view of drawing 1 .

[Drawing 3] It is the expanded sectional view of an important section showing operating state.

[Description of Notations]

1 Case

2 Drive Motor

41, 42, 71, 72 1st movement translator

8 1st Driving Shaft

9 2nd Driving Shaft

10 Attachment

11 Brush Object

13 15a 2nd movement translator

15 Extension Bar

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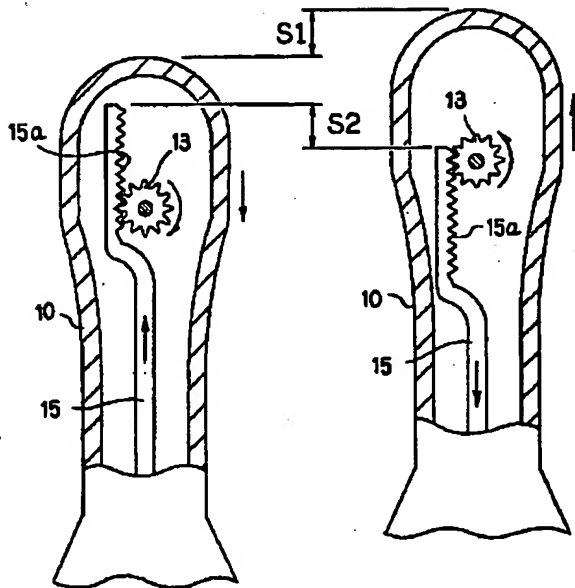
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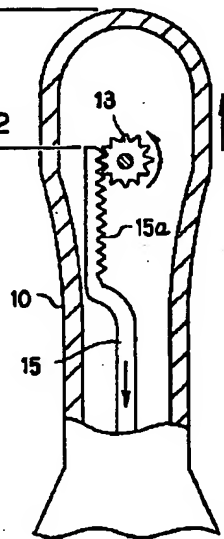
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DRAWINGS

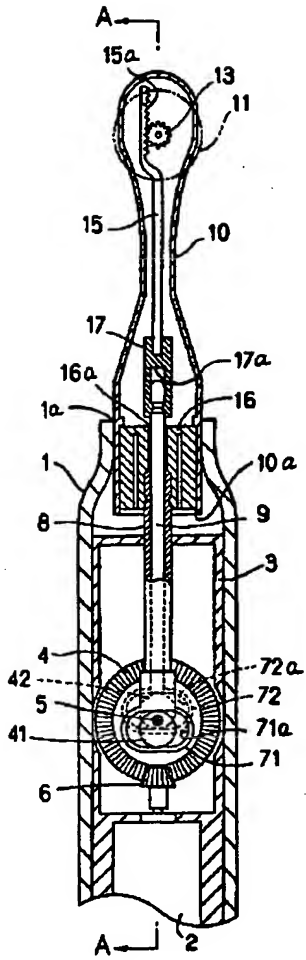
[Drawing 3]
(a)



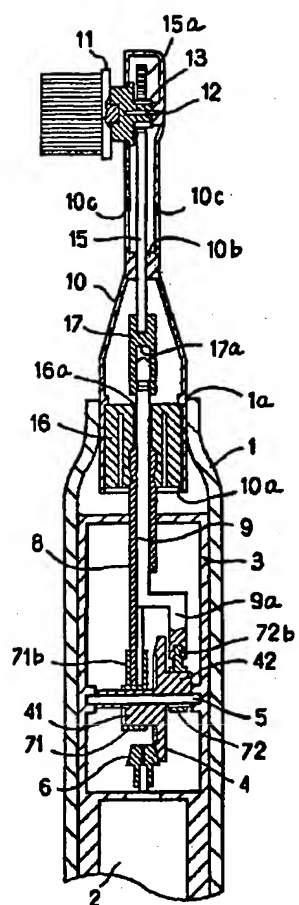
(b)



[Drawing 1]



[Drawing 2]



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